

Docket No. 43431X00
Serial No. 10/765,984
Office Action dated November 1, 2005

REMARKS

I. Introduction

By the present Amendment, claims 1, 4, 6, 11, and 12 have been amended. No claims have been added or canceled. Accordingly, claims 1-12 remain pending in the application. Claims 1, 2, 4, 6, 11, and 12 are independent.

II. Office Action Summary

In the Office Action of November 1, 2005, claims 1, 4, 6, and 11 were objected to because of various informalities. Claim 12 was rejected under 35 USC §112, second paragraph, as being indefinite. Claims 1-3, 6, and 8-11 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 6,490,384 issued to Yong. Claims 1-3 and 6-9 were rejected under 35 USC §102(e) as being anticipated by U. S. Patent No. 6,704,475 issued to Jin, et al. ("Jin"). Claims 4, 5, and 7 were rejected under 35 USC §103(a) as being unpatentable over Yong in view of U.S. Patent Application No. 2003/0002782 to Giles, et al. ("Giles"). These rejections are respectfully traversed.

III. Informalities

Claims 1, 4, 6, and 11 were objected to because of various informalities. Specifically, the Office Action cites various instances of language that appeared to be grammatically inconsistent. The Office Action further notes that similar inconsistencies were present in claims 4, 6, and 11.

By the present Amendment, Applicants have amended claims 1, 4, 6, and 11, in part, to address the issues raised in the Office Action.

Accordingly, this objection should be withdrawn.

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IV. Rejections under 35 USC §112

Claim 12 was rejected under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. Regarding this rejection, the Office Action cites various instances of language that was considered indefinite and/or otherwise lacking in proper antecedent basis.

By the present Amendment, Applicants have amended claim 12 to address the issues raised in the Office Action. It is therefore respectfully submitted that, as amended, claim 12 satisfies the requirements of 35 USC §112, second paragraph.

V. Rejections under 35 USC §102

Claims 1-3, 6, and 8-11 were rejected under 35 USC §102(b) as being anticipated by Yong. Regarding this rejection, the Office Action indicates that Yong teaches an optical switch that comprises a collimator array including a first collimator, a mirror array with a plurality of movable mirrors, a first mirror, a second mirror, and a second collimator. The Office Action further asserts that light leaving the second mirror passes the first mirror and the mirror array and optically couples to the second collimator. Applicants respectfully disagree.

As amended, independent claim 1 defines an optical switch that comprises:

a collimator array including a plurality of input collimators and a plurality of output collimators at a same position coupled to optical fibers;

a mirror array with a plurality of movable mirrors in a common horizontal plane, said mirror array having optically coupled thereto a light leaving said collimator array;

a first mirror having optically coupled thereto the light leaving said movable mirrors of said mirror array;

a second mirror having optically coupled thereto the light leaving said first mirror; and

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wherein the light leaving said second mirror passes said first mirror and said mirror array, and optically couples to said collimator array, and

wherein said movable mirrors of said mirror array switch combinations of said output collimators and said input collimators.

According to independent claim 1, the optical switch includes a collimator array including a plurality of input collimators and a plurality of output collimators at a same position is coupled to optical fibers, and a mirror array that has a plurality of movable mirrors in a common horizontal plane. The mirror array is optically coupled to light leaving the collimator array. The optical switch also includes a first mirror that is optically coupled to light leaving movable mirrors of the mirror array, and a second mirror optically coupled to light leaving the first mirror. Furthermore, light leaving the second mirror passes the first mirror and the mirror array. The light optically couples the second mirror to the collimator array. Furthermore, the movable mirrors of the mirror array switch combinations of the output and input collimators.

Applicants' review of Yong has not revealed disclosure or suggestion for all the features recited in independent claim 1. Yong discloses an optical switching system that modulates two-dimensional optical paths of optical signals from fiber to fiber. The optical switching system provides a two axes switching capability of the optical signal by utilizing two one-directional modulators. Light leaving the second mirror of Yong does not enter into the input collimator without returning to the first mirror. Consequently, Yong is incapable of providing the claimed feature of "wherein the light leaving said second mirror passes said first mirror and said mirror array, and optically couples to said collimator array..."

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

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Claims 3 and 7-10 depend from claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Independent claims 2 and 6 both define optical switches that include components and features that are somewhat similar to those recited in independent claim 1. For example, each of these claims recites the feature of "wherein the light leaving said second mirror passes said first mirror and said mirror array, and optically couples to said collimator array." As previously discussed with respect to independent claim 1, Yong does not appear to disclose or suggest this particular feature.

It is therefore respectfully submitted that independent claims 2 and 6 are allowable over the art of record.

VI. Rejections under 35 USC §102

Claims 1-3 and 6-9 were rejected under 35 USC §102(e) as being anticipated by Jin. Regarding this rejection, the Office Action asserts that Jin discloses an optical switch that comprises a collimator array including a first collimator, a mirror array with a plurality of movable mirrors, a first mirror, a second mirror, and a collimator. The Office Action further asserts that light leaving the second mirror passes the first mirror and the first mirror array and optically couples to the second collimator. Applicants respectfully disagree.

Jin appears to disclose a mirror for use in microelectromechanical system (MEMS) optical devices. Jin also illustrates an optical cross-connect system for optical signal routing. However, the arrangement disclosed by Jin appears to be different from that set forth in the claimed invention. More particularly, Jin only

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provides a first fixed mirror that passes light to the mirror array and the collimator array. In contrast, the claimed invention additionally provides a second fixed mirror such that light leaving therefrom passes to the first mirror and the mirror array, and optically couples to the collimator array. See Fig. 1. Such an arrangement provides various benefits that cannot be achieved by Jin. For example, consider the situation where X represents the deflection angle of mirror 212, $D1$ represents the distance between mirror 212 and the first mirror, and $D2$ represents the distance between the first mirror and mirror 215. According to this configuration, the range for selecting the output side collimator can be defined as $(D1+D2) * \sin(X)$. According to the present invention, the inclusion of a second fixed mirror introduces a third distance, $D3$, defined as the distance between the first mirror and the second mirror. Accordingly, the range for selecting the output side collimator becomes defined as $(D1 + D2 + 2D3) * \sin(X)$. This allows the output light to be swung more widely when selecting the output collimator.

It is therefore respectfully submitted that independent claim 1 is allowable over Jin.

Claims 3 and 7-9 depend from independent claim 1, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 1. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

Claims 2, 4, and 6 each define optical switches that recite features and elements somewhat similar to those recited in independent claim 1. Specifically, these claims each recite the feature of "wherein the light leaving said second mirror passes said first mirror and said mirror array, and optically couples to said collimator array."

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It is therefore respectfully submitted that claims 2, 4, and 6 are allowable over the art of record.

VII. Rejections under §103

Claims 4, 5, and 7 were rejected under 35 USC §103(a) as being unpatentable over Yong, in view of Giles. As previously discussed, however, Yong fails to disclose various features recited in independent claims 1 and 4. The inclusion of Giles as a secondary reference does not appear to remedy the situation. Applicants note that Giles also does not appear to disclose the feature of "wherein the light leaving said second mirror passes said first mirror and said mirror array, and optically couples to said collimator array."

It is therefore respectfully submitted that claims 4, 5, and 7 are allowable over the art of record.

VIII. Information Disclosure Statement

U.S. Patent No. 6,549,699 to Belser, et al. discloses a movable mirror switch combination for input and output of a collimator array. According to Belser, a collimator alignment mirror is designed to correspond with the input port (110-1) for adjusting the alignment of the multi-wavelength input optical signal. This ensures that spectral channels impinge onto the corresponding channel micro-mirrors. See column 6, lines 56-67. The collimator adjusting mirror of Belser appears to only adjust the input and output channels. It does not appear to actually switch between inputs and outputs. Input and output switching is provided by channel micro-mirrors (103) that are pivotable such that the spectral channels are directed into selected ones of the output ports. Belser differs from the claimed invention and does not appear to provide features recited in the claims.

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Applicants therefore respectfully submit that the presently claims are patentable over Belser.

IX. Conclusion

For the reasons stated above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a Notice of Allowance is believed in order, and courteously solicited.


If the Examiner believes that there are any matters which can be resolved by way of either a personal or telephone interview, the Examiner is invited to contact Applicants' undersigned attorney at the number indicated below.

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AUTHORIZATION

Applicants request any shortage or excess in fees in connection with the filing of this paper, including extension of time fees, and for which no other form of payment is offered, be charged or credited to Deposit Account No. 01-2135 (Case: 500.43431X00).

Respectfully submitted,
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